BELLCOMM, INC.

SUBJECT: Differences in Biomedical Results from Soviet and American Manned Space Flights - Case 340

DATE: December 5, 1966

FROM: A. N. Kontaratos

ABSTRACT

Differences between the biomedical findings obtained from Soviet and American space flights are identified and discussed. Findings have varied in the vestibular and circulatory area.

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MEMORANDUM FOR FILE

Comparison of the biomedical results obtained from Soviet and American orbital manned space flights reveals the existance of differences in vestibular and circulatory response.

Several of the Soviet cosmonauts have experienced disorientation, postural illusions and illusions of motion with resulting discomfort (Ref. 1 and 2). Conversely, no U. S. astronauts have had disorientation of any sort on any Mercury on Gemini mission (Ref. 3). However, Cariolis stimulations have been reported by the GT-8 crew alone, but only during their unscheduled high roll rate (Ref. 4).

This basic difference in vestibular response between Russians and Americans is hard to explain. No Soviet spaceship has approached the high roll rate of one revolution per 0.8 sec reached in GT-8. Also the occupational background and training of U. S. and USSR space crews are fundamentally the same.

It is a known fact, however, that reactions to stress are critically dependent upon the exact environmental configurations and functional situations at the time of the exposure. It is hard to believe that normal sea level atmosphere (used in the Soviet spacecrafts) coupled with weightlessness could be responsible for adverse vestibular manifestations. On the other hand, sensory underload in combination with weightlessness (lack of gravitational stimulus) could disturb the integrative patterns of the central nervous systems with resulting vestibular disturbances. Soviet cosmonauts as opposed to their American counterparts were neither in the control loop of their space system nor operationally linked with the mission. In this connection Russian testimony is very revealing. Adverse vestibular responses were suppressed whenever the cosmonaut was busy with observations or other work (Ref. 2).

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Another point of considerable interest is the decrease in red blood cells observed in U. S. astronauts after their flights (Ref. 3). Their Soviet counterparts have had no post flight decrease in red cell count. This hematologic difference appears to be attributable to the 100% oxygen atmosphere used in U. S. spacecrafts and not to weightlessness (Ref. 4). Russian cosmonauts used a sea level, 21% oxygen, 79% nitrogen atmosphere.

In all U. S. missions to date, the in-flight blood pressures remained within a normal range demonstrating no evidence of hypotension (Ref. 3). Conversely, the Soviets have reported a marked drop in blood pressure under conditions of weightlessness (Ref. 5 and 6). This was detected by a physician on board the Voskhod 1 spacecraft. Among the recorded readings of the systolic blood pressure were figures ranging between 70 and 75 mm of mercury, instead of the average of about 120 mm. If the Russian claim is correct, then it could be argued that the difference in findings between the two countries may be due to the physical effort of the U. S. astronauts to measure their own blood pressure. According to Soviet results such an effort would trigger a compensatory response that could increase the blood pressure to within a normal range. Automatic blood pressure recording has not been made in any U. S. flight.

Russian data also indicate that moderate physical activity during space flight can cause high pulse rates, sweating and early fatigue (Ref. 5). According to Russian physiologists these observations suggest shifts in the regulation and dynamics of the circulatory system that could effect performance. Physiological reactions to mild excercise in Gemini missions have failed to produce similar effects. However, such effects have been seen in Gemini during demanding operational phases such as EVA. One is, thus, lead to suspect the definitions rather than the results as the source of apparent differences.

Finally, the Soviets have reported a cardiac response that has not been established by U. S. measurements. This concerns the interval between the normal electrical stimulation of the heart and the mechanical action it evokes. Russian data indicate that this interval (electromechanical delay) is prolonged compared with established ground baselines (Ref. 2). However, pertinent studies on Gemini flights have failed to confirm this result. It is believed that the difference here lies in the dissimilarity of the techniques used by Soviet and American investigators (Ref.7).

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